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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

GUIDELINES FOR SAFE RESPONSE TO HANDLING, STORAGE, AND TRANSPORTATION ACCIDENTS INVOLVING ARMY TANK MUNITIONS OR ARMOR WHICH CONTAIN DEPLETED URANIUM

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JULY 1996

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Headquarters, Department of the Army, Washington, D.C.
21 July 1996

REPORTING OF ERRORS

You can help improve this bulletin. If you find any mistakes or know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this bulletin direct to: Director, US Army Armament and Chemical Acquisition and Logistics Activity, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. A reply will be furnished to you.

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CHAPTER 1

GENERAL

1-1. PURPOSE AND COVERAGE.

a. In view of the complicating factors that may arise in an emergency, it is impossible to establish simple rules of procedures to cover all situations. However, in any emergency, the primary concern must always be the protection of personnel.

b. This bulletin provides guidance for personnel on actions recommended prior to, during, and after notification of an accident involving ammunition and/or armor containing depleted uranium (DU). This guidance is intended for use to minimize ingestion of toxicological material and external contamination. Even though radiation doses resulting from the use and handling of DU are usually far below the regulatory limits, an effective program is necessary to assure they are maintained As Low As Reasonably Achievable, in accordance with Nuclear Regulatory Commission (NRC) direction. Information contained in this bulletin should be incorporated into local emergency procedures where applicable. Local emergency procedures should be preplanned and rehearsed on a regular basis.

c. This bulletin is intended for use with the following Army ammunition items, and any future developed items which contain DU:

CARTRIDGE	25MM	APFSDS-T	XM919	weight of DU = classified
CARTRIDGE	105MM	APFSDS-T	M774	weight of DU = 7.41 lb
CARTRIDGE	105MM	APFSDS-T	M833	weight of DU = 8.08 lb
CARTRIDGE	105MM	APFSDS-T	XM900E1	weight of DU = classified
CARTRIDGE	120MM	APFSDS-T	M827	weight of DU = 6.90 lb
CARTRIDGE	120MM	APFSDS-T	M829	weight of DU = 8.69 lb
CARTRIDGE	120MM	APFSDS-T	M829A1	weight of DU = classified

1-2. CHEMICAL AND RADIOACTIVE CHARACTERISTICS OF DU: All uranium extracted from ore is composed of three primary isotopes of uranium. They are 234-Uranium, 235-Uranium, and 238-Uranium, abbreviated U234, U235, U238, respectively. The proportion of each of these isotopes in natural uranium is 0.0057 percent U234, 0.7204 percent U235, and 99.2739 percent U238. The proportions of each of these isotopes in DU is 0.0005 percent U234, 0.25 percent U235, and 99.75 percent U238. DU is a by-product of the uranium enrichment process, during which natural uranium is enriched by increasing the percentage of the U235 isotope. Uranium enriched in the U235 isotope is of use to the nuclear industry as fuel for nuclear reactors. DU, no longer of use to the nuclear industry for recovery of the U235 isotope, is useful for nonnuclear applications. Properties which make DU of interest in military use are its high density and strength; ease and relatively low cost of fabrication; and

its availability. The radioactive emissions from DU are the result of spontaneous radioactive decay forming daughter atoms. Uranium decays by alpha particle emission. The daughter atoms which are formed during the decay emit alpha, beta, and gamma radiations. Thus, since radioactive decay is a continuing process, the radiation emitted from DU consists of alpha, beta, and gamma radiation.

1-3. REQUIRED NOTIFICATION DU MUNITIONS. HQ, Industrial Operations Command (IOC), ATTN: AMSIO-DMW, Rock Island, IL 61299-7630, maintains Nuclear Regulatory Commission (NRC) license, SUC 1380, which authorizes storage of Army DU ammunition at Army installations. The following describes accidents and incidents requiring notification to the license Radiation Protection Officer (RPO). Telephonic notifications can be made to the license RPO, Defense Switched Network (DSN) 793-2965/2969, commercial (309) 782-2965/2969. These are not secure lines, therefore, if classified information must be discussed, a call back will be made from a secure line after the initial notification. After duty hours call the ACALA staff duty officer, DSN 793-5621, commercial (309) 782-5621. Accidents and incidents involving ammunition items containing DU components will be reported in accordance with Army procedures to the local RPO. The local RPO will report any accident or incident to the license RPO. The license RPO will report accidents and incidents to the NRC as required. Reports to the NRC will be made to the NRC Regional Office serving the license RPO regardless of the location of the accident or incident.

a. The following types of accidents and incidents will be reported as expeditiously as possible, throughout the Army accident reporting systems, to the local RPO and license RPO:

(1) Theft or loss of control of ammunition items containing DU components.

(2) Functioning of ammunition items containing DU components.

(3) Fires, explosions, or accidents involving storage structures, transport vehicles, or Army weapons systems that contain ammunition items containing DU components, where the ammunition items are or could be damaged.

(4) Accidents or incidents that damage or expose the DU components to the environment, or release DU to the environment.

Initial notification for the above types of accidents and incidents will be made telephonically or by priority message with a written follow-up report within 45 days. When required, the license RPO will contact the NRC and HQ, AMC, ATTN: AMCSF-P, within one hour of initial notification to the license RPO. Follow-up reports will be submitted to the NRC as the situation requires.

b. The following types of accidents and incidents will be reported within 30 days, through the Army accident reporting system, to HQ, AMC, ATTN: AMCSF-P, and license RPO: HQ, IOC, ATTN: AMSIO-DMW:

(1) Fires or explosions involving storage structures, transport vehicles, or Army weapons systems that contain ammunition items containing DU components that are not reportable under the Army accident reporting system, where the ammunition items are not damaged.

(2) Accidents or incidents that cause damage to storage structures, transport vehicles, or Army weapons systems, that contain ammunition items containing DU components, that are reportable under the service accident reporting system, where the ammunition items are not damaged.

(3) Accidents or incidents that damage ammunition items containing DU components without damaging or exposing the DU components to the environment, that are reportable under the service accident reporting system.

(4) Accidents or incidents that result in an actual or potential radiation exposure from material covered by this bulletin in excess of the applicable limits for exposure to ionizing radiation.

c. Interim or final written reports will be transmitted throughout the local RPO to the license RPO within 30 days of the accident or incident. If an interim report is submitted, a final report will be submitted as expeditiously as possible. When required, the license RPO will provide the NRC with an interim or final report within 45 days of the accident or incident. If an interim report is submitted to the NRC, the license RPO will forward a final report within 15 days of its receipt by the licensee. Unless specifically directed otherwise, only unclassified information will be transmitted to the NRC.

1-4. REQUIRED NOTIFICATION DU ARMOR: Accidents and incidents involving the DU armored tank will be reported immediately through the Army accident reporting system to the local RPO or Nuclear, Biological and Chemical (NBC) Non-Commissioned Officer (NCO). The local RPO or NBC NCO will report any accident or incident to the TACOM RPO, DSN 786-7635/6121, commercial (810) 574-7635/6121. The above lines are not secure lines, therefore, if classified information must be discussed, a call back will made from a secure line after the initial notification. After duty hours call the TACOM staff duty officer,, DSN 786-5935/5511, commercial (810) 574-5935/5511. Address of command is: Commander, U.S. Army Tank-Automotive and Armaments Command (TACOM), ATTN: AMSTA-CZ, Warren, MI 48397-5000. The TACOM RPO will report any accidents and incidents to the NRC, as required. TACOM maintains the NRC license, SUB-1536, which authorizes possession and use of DU armored tanks.

a. The following types of accidents and incidents will be reported as expeditiously as possible, through the Army accident reporting system, to the local RPO and TACOM RPO:

(1) Theft or loss of control of DU armored M1A1 tanks.

(2) Fires, explosions, or accidents where DU armored M1A1 tanks are or could be damaged.

(3) Accidents or incidents that damage or expose the DU armor to the environment, or release DU to the environment.

(4) Accidents or incidents that result in an actual or potential radiation exposure from DU armor in excess of the applicable limits for exposure for ionizing radiation.

b. Initial notification for the above types of accidents/incidents will be telephonically or by priority message with a written follow-up report within 15 days. Interim or final written reports will be transmitted through the local RPO to the TACOM RPO within 30 days of the accident or incident. If an interim report is submitted, a final report will be submitted as expeditiously as possible. When required, the TACOM RPO will contact the NRC and HQ, AMC, ATTN: AMCSF-P. Follow-up reports will be submitted to the NRC as the situation requires, by the TACOM RPO. Unless specifically directed otherwise, only unclassified information will be transmitted to the NRC. Accident/incident reports shall include the following:

(1) Name of person reporting.

(2) Phone number of person reporting.

(3) Location of accident site.

(4) Date and time of accident.

(5) Organization involved in accident.

(6) Equipment involved.

(7) Property damaged and/or contaminated.

(8) Extent of injuries/overexposure.

(9) Narrative description of accident.

(10) Cause of accident (if known).

11) Type of collision (rollover, jackknife, head on, etc.) and vehicle speed.

(12) Fire involved (yes or no).

(13) Did weather conditions contribute to accident?

(14) Did defective equipment contribute to accident? What component and how is it defective?

(15) Individuals and agencies known to have been notified and the response being made.

CHAPTER 2

GENERAL FIREFIGHTING GUIDELINES

2-1. GENERAL. This information is general; specific information for inclusion in local Standing Operating Procedures should be coordinated with local fire protection personnel.

2-2. SAFETY MEASURES. The standard firemen's bunking clothing, boots, and helmet provide adequate shielding against contamination which may be present. **Self-contained breathing apparatus and tight fitting goggles should be worn if at all possible.** The fact that some or all of these items are not available should not hold up rescue of personnel.

2-3. ATTACKING THE FIRE. If the decision is made to attack the fire, and if the available supply of water and other extinguishing agents are adequate, it may be possible to cool the weapon with a water fog and extinguish the main fire at the same time. If the water supply is such that both cooling and extinguishing operations cannot be accomplished, and it appears that the fire can be extinguished or controlled to a point at which heat absorbed by the weapon will not exceed safe limitations, it may be advantageous to use all available water on the fire itself.

a. Approach the fire from upwind and at a maximum angle to any armament that might be involved. (For instance, since the heat of the flames might fire them, do not approach directly into the line of guns, rockets, or missile in the nose, tail, or wings of a wrecked aircraft.) The approach should afford maximum effective application of extinguishing agents on the critical area and permit rapid withdrawal of personnel and equipment.

b. The most important objectives are to cool the high explosive and to secure control of fuel or adjacent fires quickly. If a weapon is located, cool its entire surface with the available extinguishing agent.

c. Water is the most effective agent for cooling a weapon, or for extinguishing a fire involving high explosives and propellants. Application as a fog or spray is desirable. High pressure application can be dangerous; it can scatter exposed explosives such as may be encountered with a damaged weapon.

d. Foam in a wet mix may effectively be used to extinguish fires in explosives and propellants. Its disadvantages are that it is not as good a cooling agent as water, and it conceals the extinguished but still dangerous residue. This concealment increases the probability that the sensitive explosive will be stepped upon, and increases the difficulty of cleanup after the fire. The insulating quality of foam may be used effectively to shield a cool weapon from flame or heat.

e. High explosive and propellant materials have all the oxygen necessary for combustion included in their chemical composition. Therefore, dry powder, carbon dioxide (CO_2), or other agents which extinguish fires by smothering or displacement of oxygen, are not effective in extinguishing fires in explosives and propellants. These extinguishing agents can, however, be used to gain control of fuel fires which, if permitted to continue burning, would involve the weapon.

f. After initiation of firefighting, if evacuation of firefighting personnel is required, they will be withdrawn immediately upon order of the senior fire department officer. If possible, equipment will also be withdrawn. The minimum evacuation distance will be 366 meters (1200 feet) for firefighters and related support personnel.

g. As they burn, high explosives melt, flow, drip, spread, and mix with surrounding ground or wreckage. After the fire is extinguished, these explosives are safe only if they are completely burned. **HIGH EXPLOSIVES WHICH HAVE NOT COMPLETELY BURNED REMAIN AN EXTREME EXPLOSIVE HAZARD.** After these explosives have cooled below ignition temperature they will, like metal, take on curious shapes. They may have picked up impurities, while molten or burning, which will make them actually more dangerous than they were before melting.

CHAPTER 3

GENERAL GUIDELINES FOR ACCIDENTS INVOLVING AMMUNITION CONTAINING DEPLETED URANIUM (DU)

3-1. GENERAL. In establishing safety controls for ammunition containing DU, it is important to place the potential hazard of the DU component in the proper perspective. The potential hazard of DU is secondary to that of the explosives in munitions. In no way is this guide intended to downplay the importance of explosives safety, and the knowledge needed to respond to an explosive accident. In most cases, the precautions taken for the explosive hazard will be sufficient to limit any possible radiological or toxicological hazard. In the most extreme case of the ammunition being involved in a fire, the additional precautions, as described in this bulletin, should be taken.

3-2. TRANSPORTATION ACCIDENTS - GENERAL. It is the responsibility of each shipper to know and comply with all applicable Federal, State, and local transportation laws, ordinances, and regulations, as well as Army regulations pertaining to the shipment of hazardous materials. Shipping papers should be complete and accurate. A sample DD Form 836, "Special Instructions to Motor Vehicle Drivers", is provided in appendix B. The driver of a truck carrying hazardous materials must carry the shipping papers in the truck cab, within reach and readily visible to a person entering the cab. When not at the wheel, the driver must leave them on the seat or in a container on the side of the driver's door. Shipping papers contain valuable information for emergency response personnel, including the name and telephone number of the consignor. Notification of the consignor may be required, therefore, telephone numbers on shipping papers should be for 24-hour notification. The person taking the initial notification of an accident/incident should obtain the following information as a minimum:

a. Bill of lading number.

b. Time and location of accident.

c. Telephone number from which the call is being made, and instructions for reestablishing contact.

d. Detailed description of the accident, including all known facts relating to the condition of the cargo, property damage, and personnel injuries.

e. The names of individuals and agencies known to have been notified, and the response being made.

f. Identify who has taken charge at the scene, if known.

g. The type of assistance that is known to be needed.

Upon notification of a transportation accident dealing with ammunition containing DU, the person taking the call should immediately brief the local commander, transportation officer, explosives personnel, RPO, and public affairs officer as a minimum. These people should be available to provide assistance via telephone, or in person, if requested.

3-3. TRANSPORTATION, STORAGE, AND USE ACCIDENTS/INCIDENTS - NO FIRE OCCURRED. In the event the munition is involved in an accident or incident in which fire does not occur, normal inspection of the munition should be performed to determine the extent of damage. In addition to a review by a knowledgeable explosives specialist (e.g., explosive ordnance disposal or quality assurance specialist ammunition surveillance personnel), a review should be made by a person proficient in the use of radiation detection instruments. The inspection should be made using radiation detection instruments, as discussed in chapter 6, to determine if any DU was scattered. Although a minimal hazard exists to the public from this type of accident, persons entering the area where the DU is scattered should be kept to a minimum to prevent further scattering of the DU. Collection of the DU can be accomplished using one of the methods described in chapter 7. In a transportation accident, if the packages are damaged, they should be replaced prior to continued shipment of the munitions. Packages damaged in accidents should be checked for radioactive contamination, as prescribed in chapter 6. If found free of radioactive contamination, packages may be disposed through normal methods, or, if contaminated, they must be decontaminated using one of the methods described in chapter 7, or repackaged and disposed of as radioactive waste in accordance with AR 385-11. If munitions are damaged beyond use, they should be returned through normal ammunition channels for demilitarization. After demilitarization is complete, disposition instructions for the DU penetrator will be requested in accordance with AR 385-11. Only facilities with proper NRC licenses and approved procedures may perform demilitarization on ammunition containing DU.

3-4. CHARACTERISTICS OF DEPLETED URANIUM IN A FIRE. DU will either be in solid penetrator form, solid fragmented pieces of penetrator, or a DU oxide dust, that forms as the penetrator is heated in the fire. However, the toxicological/radiological characteristics of the DU are a secondary hazard, for a person fighting the fire, for the following reasons:

a. DU emits very low levels of penetrating radiation (primary concern is gamma radiation). Therefore, a firefighter will receive insignificant levels of radiation exposure to his body upon approaching the accident. External exposures will be far below the limits set by regulatory agencies.

b. The self-contained breathing apparatus that is worn by firefighters will protect against the inhalation of any DU oxide dust which could be entrained in the smoke plume of the fire. Burn tests that have been conducted on these DU rounds indicate that very little DU, if any, is contained in the fire's smoke plume.

c. Significant concentrations of DU oxide dust could be expelled from the fire in the event of an explosion after an appreciable amount of DU has been oxidized. Keeping out of the downwind plume, or wearing a self-contained breathing apparatus, will provide adequate respiratory protection.

3-5. TRANSPORTATION, STORAGE AND USE ACCIDENTS/INCIDENTS - FIRE OCCURRED. The potential hazards surrounding a fire involving ammunition which contains DU (staballoy) and the protective measures which can be taken to prevent an accident should be anticipated to the maximum extent feasible. Written plans of action or Standing Operating Procedures should be familiar to all personnel who may be involved. The following is basic emergency response guidance for operations involving DU.

a. The first priority in an accident should be assistance to injured personnel. If fire is present, there is a danger of detonation of the explosives; remain upwind and uphill from the fire where possible. Keep away from the accident if fire is likely, except in the case of emergency life saving assistance. If you must perform emergency assistance to personnel, use any available method to prevent smoke from entering your eyes, nose, and throat. In the absence of a self-contained breathing apparatus or respirator, the methods described in appendix C are recommended to protect you from smoke when performing life saving operations.

b. If a fire exists, it should be reported immediately to the nearest fire department, whether military or municipal. The techniques for fighting a fire involving ammunition containing DU are the same as those used in fighting fires involving other ammunition in the same hazard classification. These techniques are designed to limit the hazard from the explosive and fragments. General firefighters guidelines are provided at chapter 2. Fire departments at military installations will be familiar with these methods, and are required to exercise them at specific intervals. Fire departments at military installations will respond to a bulk storage accident, as described in the Local Disaster Control Plan. Fire departments responding to transportation accidents will use methods as described in Department of Transportation (DOT) P 5800.3, "Guidebook for Hazardous Materials Incidents." The International Association of Fire Chiefs, in cooperation with the DOT, distribute DOT P 5800.3 to fire, police, and other emergency services organizations. Additional information may be provided with shipping papers via DD Form 836, "Special Instructions for Motor Vehicle Drivers." A sample DD Form 836 is provided in appendix B. Fire departments responding to tank fires should be directed by a tank fire control officer or a crew member familiar with firefighting procedures. Tank personnel should utilize instructions similar to those provided at appendix D in a bilingual form, and bilingual notices may also be useful in controlling access to areas around the tank. In all cases, the decision, whether to fight the fire or withdraw, must be made by the senior on-scene fire department officer based on an assessment of the accident environment.

c. One of the first actions is to clear the area of all personnel not actually needed or engaged in the firefighting operation. Recommended distances required to clear the area are provided for transportation accidents (app B) and for Tank accidents (chap 4). All personnel evacuated from the area should report to a control point established upwind from the accident site. Personnel injured in the accident will be evacuated through medical channels. Injured personnel evacuated from the accident scene should be tagged to identify possible exposure to DU contamination. Medical treatment for serious injuries takes priority over contamination surveys and decontamination, as prescribed in chapters 6 and 7, respectively.

d. Every effort should be made to contain the spread of contamination to within the radiation control line. Contaminated clothing should be removed, if feasible, at the site. If someone wearing contaminated clothing leaves the site, make sure that the area entered is surveyed and decontaminated. Blankets or something similar should be hung at the radiation contamination control line in order to provide personal privacy for those who must remove contaminated clothing. Also, the injured person should be wrapped in a clean sheet to prevent the possible spread of contamination. Contaminated clothing need not be removed from a seriously injured person.

e. After the fire has been extinguished, a controlled area around the accident site must be maintained until it is declared safe by Explosive Ordnance Disposal (EOD) and a senior radiation protection person.

f. Emergency response personnel who sustain minor injuries but are also contaminated with DU should be decontaminated prior to treatment of minor injuries, provided concurrence is obtained from medical persons. Equipment including vehicles exiting the fire area are to be monitored and decontaminated by radiation protection personnel, as directed in chapters 6 and 7, respectively.

g. Upon arrival of EOD, render safe operations will be performed. Radiation protection personnel will set up a radiation contamination control line upon their arrival. The radiation contamination control line should be adjusted depending on the extent of ground contamination. The radiation protection personnel should not approach the area prior to EOD declaring the area safe from an explosive standpoint. The EOD personnel should not approach the area without appropriate clothing and respiratory protection, as described in chapter 6. The number of emergency personnel who are to pass over the radiation contamination control line should be kept to an absolute minimum.

h. A person should be assigned to assure that the names, addresses, and telephone numbers of those people who cross over the radiation contamination control line, whether contaminated or not, are recorded along with the results of personnel monitoring.

i. After the EOD has declared the area safe from an explosives standpoint, radiation protection personnel will conduct a radiological survey of the ground. The radiological survey of the ground should be conducted using methods described in chapter 6. Areas noted to be contaminated should be marked, and decontamination should be performed as described in chapter 7.

j. The chain of command/local military community will assure that waste receptacles are available, and located at the radiation contamination control line for the disposal of contaminated clothing and equipment. Metal containers with lids should be available with 4 mil plastic bag inner linings for solid waste. Liquids must be segregated from solids to process the waste through the Army system. Liquids should be collected in plastic, earthenware, or thick-walled glass bottle inner containers. Leakproof metal cans may also be used provided the container is chemically inert to the liquid. Radioactive waste should be held at an Army installation, and disposition instructions requested in accordance with AR 385-11 from Commander, HQ, IOC, ATTN: AMSIO-DMW, Rock Island, IL 61299-7630.

k. No equipment or materials involved in the accident/incident are to be removed from the site for unrestricted use until the item(s) have been monitored by radiation protection personnel and decontaminated as required. Equipment and material release should be adequately documented by radiation protection personnel and proper security procedures should be in force to prevent pilferage.

CHAPTER 4

TANK FIRES[1]

4-1. FIRE PREVENTION PRECAUTIONS. Fire prevention precautions, to include local regulations and procedures, should be understood and practiced by each individual involved in tank operations. Crew members should be alert for the smell of smoke or fuel. Engine and crew compartments should be kept free of unnecessary combustible materials; organizational clothing and individual equipment should be stored in accordance with loading plan. Antennas on vehicles should be tied down to specified heights to prevent striking overhead electrical wires, since this is the primary cause of tank fires. Periodically, the vehicle commander should glance at the grills for evidence of smoke or indications of fire. Fixed fire extinguishing systems should be maintained properly, and inspected at frequencies described in operators technical manuals. Tank personnel should be adequately instructed on preventing and extinguishing fires in vehicles. Fire drills should be practiced by tank crews at frequencies required to ensure automatic implementation of firefighting techniques should a fire occur.

4-2. GUIDELINES. These guidelines are for those involved in writing Standing Operating Procedures for, preparing for, and responding to, a tank fire involving ammunition containing DU. Appointment of an armor unit tank fire control officer, captain, or higher grade that is familiar with the local Standing Operating Procedure to implement and coordinate control, reporting, and disposal is recommended. If a tank fire should involve ammunition containing DU (staballoy) and/or DU armor, the following actions should be taken:

a. Should crew members have to evacuate the tank, they should:

(1) Attempt to shut down the engine in accordance with tank operator's manual.

(2) Attempt to activate the fire suppression system.

(3) Move a safe distance away, upwind from any smoke coming out of the tank. A safety perimeter of at least 366 meters (1200 feet) is recommended (TM 9-1300-206).

(4) One person should keep passersby away with the assistance of the local authorities (i.e., police, fire department, or military police) as soon as possible. Bilingual instructions may be useful in accomplishing this task. A second person should immediately notify:

(a) Nearest fire department, whether military or municipal, if not already on the scene.

(b) Police (military or municipal) if not already on the scene.

(c) Chain of command/local military organization.

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[1] Chapter 5 addresses fires on tanks equipped with depleted uranium armor.

(5) Limit access, within safety perimeter, to emergency response personnel consisting of firefighters, EOD personnel, radiation protection personnel, and others, as necessary. Record name of all persons entering safety perimeter.

(6) Alert firefighters that there is toxic ammunition on board, and that respiratory protection is needed. Fire Departments responding to tank fires should be directed by a tank fire control officer or crew member familiar with firefighting procedures. Tank personnel should provide a copy of firefighting instructions, similar to sample in appendix D, to firefighters. The primary hazard under these circumstances is not the radiation emitted by the DU, but rather, the explosive/fragmentation hazards caused by the activation of high explosive-type rounds, DU rounds, etc., loaded in the tank. In all cases, the decision to fight the fire, maintain firefighting efforts, or withdraw is a judgement factor that must be made by the senior on-scene fire department officer, based on an assessment of the accident environment.

NOTE

Firefighting instructions should be bilingual if local language is different than English. General firefighting guidelines are provided in chapter 2.

(7) In saving lives, use any available method to prevent smoke from entering your eyes, nose, and throat. In the absence of a self-contained breathing apparatus or respirator for use in life saving operations, the methods described in appendix C are recommended. For those potentially contaminated individuals who may sustain serious injuries, the appropriate first-aid procedures that are necessary to save life or minimize injury should be performed immediately. Contaminated clothing should be removed, if feasible. Also, the injured person should be wrapped in a clean sheet, if possible, to prevent the spread of contamination. Other than the removal of contaminated clothing, no other type of decontamination should be performed on a seriously injured person. Any person injured should be tagged to identify them as having possible exposure to DU, and evacuated through medical channels.

b. Chain of command/local military organization should immediately notify for dispatch to the scene:

(1) Local Explosive Ordnance Disposal (EOD).

(2) Local Radiation Protection Officer (RPO).

(3) Local Public Affairs Officer.

(4) Personnel to assist in decontamination and cleanup; i.e., chemical company/maintenance personnel.

c. Upon arrival of EOD, radiation protection, medical, and other support personnel the following actions should be completed:

(1) Firefighters who sustain minor injuries but are also contaminated with DU should be decontaminated prior to treatment of those minor injuries, provided concurrence is obtained from a medical person. Firefighting equipment, including vehicles, exiting the fire area are to be monitored by radiation protection personnel, as directed in chapter 6.

(2) After the fire has been extinguished, controlled access around the tank must be maintained until it is cleared by EOD and radiation protection personnel.

(3) Upon arrival of EOD, render safe operations will be performed. Radiation protection personnel will set up a radiation contamination control line upon their arrival. The radiation contamination control line should be adjusted depending on the extent of ground contamination. The radiation protection personnel should not approach the tank prior to EOD declaring the area safe from an explosives standpoint. The EOD personnel should not approach the tank without appropriate clothing and respiratory protection, as described in chapter 6. The number of emergency personnel who are to pass over the radiation contamination control line should be kept to an absolute minimum.

(4) A person should be assigned to assure that the names, addresses, and telephone numbers of those people who cross over the radiation contamination control line, whether contaminated or not, are recorded along with the results from monitoring them.

(5) The chain of command/local military community will assure that waste receptacles are available, and located at the radiation contamination control line, for the disposal of contaminated clothing and equipment. Metal containers with lids should be available with 4 mil plastic bag inner linings for solid waste. Liquids must be segregated from solids to process the waste through the Army system. Liquids should be collected in plastic, earthenware, or thick-walled glass bottle inner containers. Leakproof metal cans may also be used, provided the container is chemically inert to the liquid. Radioactive waste should be held at a nearby Army installation, and disposition instructions requested in accordance with AR 385-11 from Commander, HQ, IOC, ATTN: AMSIO-DMW, Rock Island, IL 61299-7630.

(6) After the EOD has declared the area and the tank safe from an explosive standpoint, radiation protection personnel will conduct a radiological survey of the ground, anything lying on the ground, and the exterior of the tank. The radiological survey of the ground should be conducted using methods described in chapter 6.

(7) Areas noted to be contaminated should be marked, and decontamination should be performed as described in chapter 7. No attempt should be made at the accident site to decontaminate the inside of the tank. There is no need for anyone other than EOD personnel to enter the tank. However, depending on the classification of the DU rounds involved in the fire, and the location of the accident, the EOD team may have to remove the penetrators from the tank before the tank is moved off the site. If the DU penetrators are to be removed at the accident site, they are to be handled and prepared for shipment under guidance of the radiation protection officer and the transportation officer.

(8) Upon decontamination of the exterior of the tank, any openings will be sealed to preclude the escape of any interior contamination to the environment. All openings are to be sealed with plastic, taped, and oversprayed or brushed with strippable coating compound (NSN 8030-00-264-5837).

(9) Before transporting the tank to the designated facility, any contaminated ground surface over which the tank must pass to exit the radiation contamination control line must first be decontaminated. This may entail the removal of the top layer of soil and disposal of the soil as radioactive waste, or the cleaning of a hard-surfaced road.

(10) Do not use the tank as a waste receptacle and do not attempt to decontaminate the interior of the tank.

(11) Following the tank's removal, the area that had been under the tank must be surveyed, and if necessary, decontaminated. Concurrently, all other surfaces that were contaminated are to be decontaminated to background levels. Radioactive waste must be transported to a nearby Army installation for holding until it can be disposed of as radioactive waste in accordance with AR 385-11.

(12) Security around the accident site must be maintained until the RPO certifies that the area has been satisfactorily decontaminated.

(13) For information regarding the Department of Transportation requirements for transporting the tank to a CONUS decontamination facility or disposal of the radioactive waste generated during the cleanup activities contact: Commander, HQ, IOC, ATTN: AMSIO-DMW, Rock Island, IL 61299-7630.

(14) See attached appendix H for Tank Fire Checklist.

CHAPTER 5

DEPLETED URANIUM ARMORED TANKS

5-1. GUIDELINES. In addition to the guidelines discussed elsewhere in this technical bulletin, the following additional guidelines apply to those tanks which contained depleted uranium armor, also known as Abrams Heavy Armor, in which the steel armor cover plate on the turret is compromised, and in turn, exposes the depleted uranium armor component. Presently, only M1A1 Abrams Main Battle Tanks contain depleted uranium armor.

a. Should an M1A1 Abrams-type tank be involved in an incident, such as a fire, and the outer armor plating is not compromised, then the guidelines provided in chapter 4 are sufficient.

b. If the armor on the turret experiences an impact which penetrates to the depleted uranium armor, there exists a potential for radioactive contamination of the vicinity around the tank with depleted uranium armor fragments. Disposition instructions for these fragments are to be obtained from the "Security Classification Guide for the Abrams Tank System," 21 September 1988, or current edition. This document can be obtained from the U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-CZ, Warren, MI 48397-5000.

c. Various locations on the exterior of the tank and immediate surroundings may be contaminated with depleted uranium oxide dust which is deposited as fallout from the plume, formed immediately after armor impact. The distribution of this oxide is dependent on the wind direction at time of impact. Decontamination procedures discussed in chapter 4 are sufficient for proper removal of this contamination.

d. The first priority shall be to provide immediate assistance to injured personnel. This takes priority over contamination checks and decontamination.

e. The area must be roped off to prevent unnecessary personnel from entering the area and to prevent scattering of depleted uranium.

f. The local RPO or NBC NCO will notify the unit maintenance team chief MOS 63E40 to assist in evaluating armor damage to determine whether the exposed armor area contains DU.

g. Surveys being made of the area must be made by a person proficient in the use of radiation detection instruments. This is to determine if any depleted uranium is scattered.

h. Clean the area surrounding the impact hole following the decontamination procedures discussed in chapter 7. Satisfactory decontamination should be determined by measuring the activity on swipe samples taken after clean-up efforts. Use an AN/PDR-27 with the beta shield open, an AN/VDR-2 (IM-243 meter and DT-616 probe), or an equivalent instrument, to measure the activity on the swipe sample. The measurement should be made in an area 6 feet or more from the tank, to preclude the effects of the radiation emanating from the depleted uranium armor.

i. If at all possible, immediately weld a metal armor patch over the opening which has just been decontaminated. Respiratory protection (M25 or M17A2 protective mask with M13A2 filter element, and the accompanying head cover, or their equivalent) should be worn by the welder (MOS 44B) applying the patch. For the purposes of field expediency, if a metal patch cannot be applied, to cover the impact opening, then immediately use whatever is available (e.g., duct tape, clothing, etc.). Specific guidance is contained in the "Security Classification Guide for the Abrams Tank System," 21 September 1988, or current edition.

j. The same procedures are to be followed if the interior wall of the turret housing the depleted uranium armor has been compromised.

k. For those personnel involved in an incident where the Abrams Heavy Armor has been compromised, refer to the "Security Classification Guide for Abrams Tank System," 21 September 1988, or current edition, for debriefing instructions, and in addition, contact the U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-CZ, Warren, MI 48397-5000.

l. If the methods in the technical bulletin do not completely decontaminate exterior surfaces, the contamination should be considered fixed, and the tank should be transported to a military installation before harsher methods are used. The location of the facility will be determined by the item manager. Transportation requirements will be determined by the U.S. Army Tank-Automotive and Armaments Command Safety Office in cooperation with the item manager.

5-2. TRANSPORTATION OF TANK. The exterior of the tank must be decontaminated to the levels in appendix F, and all openings in the tank closed off; transport the tank to the designated depot facility. The tank will be shipped as retrograde equipment. The shipments should be made to the nearest base or port available, and by truck or rail to an authorized depot facility. The shipment should be made within the normal defense transportation system. The tanks will be evaluated at the authorized depot facility for extent of damage and possible reuse of parts. Parts not acceptable for reuse will be either decontaminated or properly disposed of in accordance with AR 385-11.

CHAPTER 6

EXPLOSIVE ORDNANCE DISPOSAL AND RADIATION PROTECTION PERSONNEL

6-1. EXPLOSIVE ORDNANCE DISPOSAL (EOD) PERSONNEL. After the fire in the tank, storage area, etc. has been extinguished, EOD personnel should not enter the tank or other poorly ventilated area until it has cooled down and aired out. The following procedures that relate to radiation safety should be followed by the EOD personnel:

a. The number of EOD personnel who are to cross the radiation contamination control line that is established by the RPO should be kept to an absolute minimum. They are to be dressed in protective coveralls, gloves, rubberized boots, and they are to also wear the M25 or M17A2 protective mask with M13A2 filter element and the accompanying head covers (i.e., mission oriented protective posture (MOPP) Level 4). The coverall pant legs are to be worn over the rubber boots and sealed with tape at the ankles. Likewise, the sleeves are to be slipped over the gloves and taped. The edges of the hood are to be draped over the coveralls and taped to them and to the place where it contacts the respirator. Also, any remaining openings are to be sealed with tape. The RPO will supervise during this dress-up procedure.

b. EOD personnel not entering the tank building, etc., should attempt to avoid stepping in any water which may have flowed out of the area because it may be contaminated with DU.

c. Should EOD personnel determine it is necessary to empty water from the tank before their entry, they should obtain instructions from the RPO regarding procedures for containing/collecting this potentially DU contaminated water. However, if it should be the opinion of the EOD personnel that these water collection/retention procedures create an additional risk, then the water should just be emptied from the tank onto the ground.

d. Depending on the classification of the DU round involved in the fire and the location of the accident, the EOD team may have to remove the penetrators from the tank or truck before the vehicle is moved off the site. If the DU penetrators are to be removed at the accident site, they are to be handled and prepared for shipment under guidance of the RPO and transportation officer.

e. EOD personnel and equipment exiting the fire area are to be monitored by the radiation protection personnel for the presence of any DU contamination before stepping back over the radiation contamination control line.

6-2. RADIATION PROTECTION PERSONNEL. Radiation protection personnel must have available proper radiation detection instrumentation, and must be proficient in the use of such instrumentation. The RPO will direct and provide supervision of the radiation protection functions.

a. The radiation protection personnel, upon arrival, will establish a radiation contamination control line. If initial response and firefighting operations are still ongoing, control line

may be same as evacuation line established for explosive hazards. The number of emergency personnel who are to pass over the radiation contamination control line should be kept to an absolute minimum. Personnel with cuts should remain outside the contaminated area. Anyone passing over this line to the fire area is to wear appropriate protective equipment that may include: protective coveralls, gloves, rubberized boots, head covering, and respiratory protection. EOD personnel are to wear the M25 or M17A2 protective mask with the M13A2 filter element and the accompanying head covers (i.e., MOPP Level 4). Personnel assisting in the radiation survey and decontamination operations should wear full-face respirators with high-efficiency dust filters. Tape is to be used to seal the clothing where there are any openings to the body.

b. Firefighters, EOD, and any other personnel or equipment, including vehicles, exiting the fire area are to be monitored for the presence of any DU contamination before moving over the contamination control line. The monitoring instrument to be used is an AN/PDR-27 with the beta shield open, an AN/VDR-2 (IM-243 meter and DT-616 probe), or an equivalent instrument (exception vehicle survey, see para h below). These meters, when used for personnel monitoring, should be equipped with earphones to permit aural indications to supplement the slower needle response. The sensory portion of the meter probe will be placed as close to the portion of the item/body being checked as possible, without bringing the probe into direct physical contact. If DU contamination is detected, decontamination should be performed in accordance with chapter 7 under the supervision of a radiation protection person. Decontamination supplies should be made available by the local military community at the request of the RPO. A listing of useful equipment and supplies for use in decontamination is provided in appendix E. Special attention must be given to the areas between the fingers and around the nails. In addition, waste receptacles will be located at the radiation contamination control line for the disposal of contaminated clothing and equipment. Contamination release limits can be found in appendix F.

c. Every effort should be made to contain the spread of contamination to within the radiation control line. Contaminated clothing should be removed, if feasible, at the site. If someone wearing contaminated clothing leaves the site, make sure that the area entered is surveyed and decontaminated. Blankets or something similar should be hung at the radiation contamination control line in order to provide personal privacy for those who must remove contaminated clothing. Also, the injured person should be wrapped in a clean sheet, to prevent the possible spread of contamination. Contaminated clothing need not be removed from a seriously injured person. Besides wrapping the radioactively contaminated, injured person in a clean sheet to prevent the spread of contamination, clean areas adjacent to those being decontaminated should be covered with taped-down paper, plastic, or other disposable material to prevent recontamination.

d. A person should be assigned to assure that the names, addresses, and telephone numbers of those people who cross over the radiation contamination control line, whether contaminated or not, are recorded along with results of personnel monitoring. Appendix G is an example of a personnel contamination record.

e. No equipment or materials involved in the accident/incident are to be removed from the site for unrestricted use until the item(s) have been monitored by radiation protection

personnel and decontaminated as required. Equipment and material release should be adequately documented by radiation protection personnel and proper security procedures should be in force to prevent pilferage.

f. The RPO should note the direction(s) of the smoke from the fire, and where any water that flows out of the tank runs off to during the course of the fire.

g. The radiological survey of the ground should be conducted with an AN/PDR-54, AN/PDR-60, AN/PDR-56F (IM-160F/PDR-56 meter and DT-590A/PDR-56 X-ray probe) or an equivalent low-energy photon detection instrument. The probe must be held as close to the ground surface as possible without coming in direct contact. The radiation contamination control line should be adjusted depending on the extent of ground contamination. If no ground contamination is detected during the radiation survey of the area, rope off a 10-foot radius around the area to control access to it. However, should ground contamination be detected, the areas should be marked off for later decontamination efforts. The radiation contamination control line need not take on the dimensions of a circle, but may take on the shape of the detected ground contamination.

h. Survey the outside of the tank for DU contamination with an AN/PDR-54, AN/PDR-60, AN/PDR-56F radiac meter (IM-160F/PDR-56) and its accompanying radiac probe (DT-224B/PDR-56 [main probe]), or an equivalent instrument if the surface of the tank is dry. The probe must be held as close to the surface as possible without coming in contact. However, if the surface being surveyed is wet or covered with grease or dirt, there exists a condition of alpha self-absorption and an AN/PDR-27 with the beta shield open, an AN/VDR-2 (IM-243 meter and DT-616 probe) or an equivalent instrument, is to be used. Swipe/wipe the surface of any location where contamination is detected. The swipe samples should be taken with appropriate swipe paper, such as Whatman filter paper. The same instrument being used to survey the tank should be used to analyze the swipe paper. If, for whatever reason, the appropriate swipe paper is not available, then take swipes with a paper towel, cloth, etc. Under these circumstances, analyze the swipes only with an AN/PDR-27 with the beta shield open, AN/VDR-2 (IM-243 meter and DT-616 probe), or an equivalent instrument. If contamination levels are detected, the surface area that is representative of that swipe sample is to be cleaned until the removable surface contamination levels are at least reduced to those levels listed for vehicles in uncontrolled areas in appendix F.

i. If instrument surveys indicate the presence of contamination but the swipe/wipe are negative, press a piece of masking, friction, or adhesive tape onto the area and analyze it with the AN/PDR-27 or AN/VDR-2 or equivalent instrument. If the tape is contaminated, this indicates the presence of small pieces of metal and/or metallic dust. Make sure this material is removed before declaring the tank free from contamination.

NOTE

Some material used for wipes will not pick up metal filings, metallic dust, etc. The only method to detect the presence of this kind of contamination is to use tape.

CHAPTER 7

DECONTAMINATION

7-1. GENERAL DECONTAMINATION PROCEDURE. The specific decontamination methods and procedures selected for use in particular circumstances depend on the type, extent, and location of the contamination; however, the general approach to decontamination outlined below applies to most situations:

a. Decontamination should always be performed under the direction of radiation safety personnel.

b. Access to contaminated areas must be controlled.

c. Provide personnel protection, including appropriate clothing, for workers.

d. Evaluate what is to be decontaminated.

e. Obtain necessary equipment and materials (app E).

f. Survey all items to be released to an unrestricted area.

g. Begin with the mildest decontamination method and progress to harsher, more abrasive, or caustic methods as required.

h. Work from the outside of the contaminated area to the inside.

i. Isolate all clean areas from contaminated areas. Clean areas adjacent to those being decontaminated should be covered with taped down paper, plastic, or other disposable material to prevent recontamination.

j. Minimize the generation of contaminated liquids and airborne radioactivity during the work, and collect and treat as contaminated waste all liquids generated and materials used during decontamination operations.

k. Survey between major steps in the decontamination process (i.e., between successive applications of each technique and between different techniques).

l. Continue decontamination until contamination levels are reduced to appropriate levels, as given in appendix F.

m. Document the completion of decontamination, including the name of the individual performing the final survey, the date, and the survey results.

7-2. PERSONNEL DECONTAMINATION. Before external decontamination of an individual is begun, the following steps should be taken to help establish priorities for decontamination and follow-up effort:

a. Observe any physical effects on the contaminated person, such as bleeding, irregular breathing rate, burns, or shock.

b. Assess the extent of any injuries. Medical treatment of injuries takes priority over decontamination.

c. Determine the extent and magnitude of contamination using personnel survey techniques.

d. Document survey results (app G).

e. Remove contaminated clothing, place it in a plastic bag, and hold it for further disposition.

f. Obtain assistance from medical personnel if decontamination of eyes, ears, nose, or mouth is necessary.

g. Personnel should be decontaminated as quickly as possible using the least drastic means necessary.

h. Decontamination methods should begin with mild methods, which should be continued as long as they are effective, and progress to harsher methods, only as required.

i. Extreme care should be taken to prevent the spread of contamination to any skin or body opening.

j. All liquids generated and materials used during decontamination should be collected and treated as contaminated waste.

k. Personnel performing the decontamination should take all necessary precautions to protect themselves.

l. Cool or lukewarm water should be used for all washing and rinsing. Hot water causes the skin pores to open, driving contamination deeper into the skin, cold water closes the pores, trapping contamination in the skin.

7-3. SPECIFIC PERSONNEL DECONTAMINATION METHODS.

a. Thorough washing with nonabrasive soap and lukewarm water is the best general method of decontamination of the hands and other parts of the body. If the contaminant is localized, it is often more practical to mask off the affected area, and cleanse with swabs, rather than risk the danger of spreading the contaminant by general washing. Organic solvents must be avoided as decontaminating agents, because they may increase the probability of the radioactive materials penetrating through the pores of the skin. Special attention must be given to the areas between the fingers and around the nails. The outer edges of the hands are readily contaminated, and must not be neglected in the washing.

b. After repeated washings, the skin may tend to chap. To avoid this, apply lanolin or hand cream and then continue to wash. If repeated washing with soap and water is unsuccessful in the personnel decontamination, the individual should be referred to the local medical officer for application of the more drastic chemical decontamination.

c. In the event several individuals have become contaminated, or the contamination on an individual is not localized to a small portion of the body, the following decontamination procedure is recommended:

(1) Place individual in a lukewarm shower.

(2) Using a mild soap, individual should cover entire body with lather.

(3) While still covered with lather, individual should step out of shower.

(4) Sprinkle a heavy coat of mild soap flakes all over lathered individual (purpose of lather is to cause soap flakes to adhere to person).

(5) Using his hands, the contaminated individual should rub the soap flakes on his body into a paste.

(6) Individual should then return to shower and rinse soap off his person by starting at the top and working his way down.

NOTE

It will be necessary for individual to rub body surfaces with his hands while rinsing in order to remove soap paste. Soap paste will remain on those areas which have not been thoroughly washed. Although a soft cloth may be used, a brush may not. Particular attention should be given to hairy portions of the body.

(7) When the individual has rinsed himself to the point that he no longer feels slimy, and while still under shower, he should be examined by an assistant for traces of soap. The presence of soap will indicate which areas of the body have not been decontaminated.

(8) After removing all traces of soap, individual should leave the shower and dry himself.

(9) After drying off, individual must be monitored. If still contaminated, above procedures should be repeated. In the event residual contamination is localized, repeat procedures should be limited to those areas still showing contamination.

d. In all cases of personnel contamination, the RPO must be consulted. If ingestion or inhalation of radioactive material is suspected, bioassays should be performed.

7-4. EQUIPMENT AND MATERIAL DECONTAMINATION. Materials that cannot be easily or cost-effectively decontaminated should be evaluated for possible disposal as radioactive waste. Porous items (such as wood, paper, cloth), intricately-designed equipment, and items

of low replacement cost tend to fall in this category. If decontamination of equipment and/or materials is required, many cleaning, abrasive, chemical, and electrochemical methods are available. Listed here are a few of the simpler and least costly methods. These methods should be repeated until surveys indicate the need for harsher method. Under no circumstances will dry sweeping of radioactive contamination be allowed.

a. Use masking, adhesive, friction, or duct tape, place over the contaminated area, remove, and discard as radioactive waste.

b. Use vacuum-cleaning techniques with a conventional wet or dry vacuum cleaner modified to include a High-Efficiency Particulate Air filter on the exhaust. Dispose of bag or collection container as radioactive waste.

c. Wipe or wet mop, using a decontaminating agent or detergents and hot water.

NOTE

For tank fires - if the above methods do not completely decontaminate the exterior of the tank, contamination should be considered fixed and the tank should be transported to a Army facility before harsher methods are used.

d. Contaminated soil around accident and water runoff should be scraped up and containerized for removal as radioactive waste.

APPENDIX A

REFERENCES

A-1. SCOPE. This appendix lists all forms, technical manuals, and miscellaneous publications referenced in this bulletin.

A-2. ARMY REGULATIONS.

Defense Traffic Management Regulation ..... AR 55-355

Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety) ..... AR 385-11

A-3. DEPARTMENT OF TRANSPORTATION PAMPHLET.

Guidebook for Hazardous Materials Incidents ..... DOT P 5800.3

A-4. FORMS.

Special Instructions for Motor Vehicle Drivers ..... DD Form 836

A-5. TECHNICAL MANUALS.

Ammunition and Explosives Standards ..... TM 9-1300-206

Firefighting and Rescue Procedures in Theaters of Operations ..... TM 5-315

APPENDIX B

SAMPLE DD FORM 836
SPECIAL INSTRUCTIONS FOR MOTOR VEHICLE DRIVERS

TO: ..... As Appropriate

FROM: ..... As Appropriate

BILL OF LADING NUMBER: ..... As Appropriate

THIS TRUCK IS LOADED WITH: ..... As Appropriate

TYPE PLACARD REQUIRED: ..... Explosive (As Appropriate)

In Case Of Fire

4. X Yes

5. 2,500 feet.

6. 2,500 feet (1/2 mile).

In Case Of Accident

Notify consignee on Bill of Lading.

Additional Notification Required

State Radiological Control Agency and inform "Ammunition Containing Depleted Uranium" was involved. SEE BELOW:

Other Specific Precautions or Instructions

In Case Of Accident

Add phone numbers - consignee, consignor, HQ, IOC, applicable MTMC area command hotline.

Radiation levels will not be such as to present a hazard to personnel in the vicinity, although damaged packages should not be handled until checked for possible removable radioactive contamination (if handling is required, handlers should wear gloves).

Repair of disabled vehicles and damaged packages will be performed in accordance with Code of Federal Regulation Title 49, Part 177.854 and 177.855.

In Case Of Fire

- Use first aid treatment according to the nature of the injury.
- Advise medical care personnel that injured persons may be contaminated with radioactive material (DU).
- Wrap seriously injured person in a blanket to prevent spread of possible contamination during transport.
- Medical care takes priority over contamination checks and decontamination.
- Detail all persons and equipment exposed to smoke plume until released by radiological authority. If they cannot be detained, obtain names and where they can be contacted later.
- Segregate turnout gear and tools used to fight fire. Delay overhaul and area cleanup until advised to by explosive and radiological authorities.
- Dike runoff water caused by the firefighting, if possible.
- Fight fire from as far upwind as possible.
- Keep out of smoke, fumes, and dust.
- Wear full protective clothing and self-contained breathing apparatus.
- Keep unnecessary people upwind.
- Contact state radiological authority and consignee for advice and possible assistance.
- Do not move or touch damaged or undamaged packages unless absolutely necessary. If handling is required, handlers should wear gloves.

APPENDIX C

RESPIRATORY PROTECTION PROVIDED BY COMMON HOUSEHOLD AND PERSONAL ITEMS AGAINST AEROSOLS OF 1 TO 5 UM PARTICLE SIZE

ITEM	NUMBER OF THICKNESS	RESISTANCE (MM OF H_2O)	APPROXIMATE EFFICIENCY (O/O)
Handkerchief, Man's Cotton	16	36[a]	94
Toilet Paper	3	13	91
Handkerchief, Man's Cotton	8	18	90
Handkerchief, Man's Cotton, Crumpled			88
Bath Towel, Turkish	2	11	85
Bath Towel, Turkish	1	5	74
Bed Sheet, Muslin	1	22[b]	72
Bath Towel, Turkish	1 (wet)	3	70
Shirt, Cotton	1 (wet)	150[c]	66
Handkerchief, Woman's Cotton	4 (wet)	84[c]	63
Handkerchief, Man's Cotton	1 (wet)	98[c]	63
Dress Material, Cotton	1 (wet)	180[c]	56
Handkerchief, Woman's Cotton	4	2	56
Slip, Rayon	1	6[b]	50
Dress Material, Cotton	1	5	48
Shirt, Cotton	1	3	35
Handkerchief, Man's Cotton	1	2	28

a. Those items with a resistance of 36mm or greater, have limited use as respiratory protective expedients.

b. These items could not be evaluated when wet since they exhibited intolerable resistance to human breathing.

c. Resistance obtained when checked immediately after hand wringing. This resistance began to decrease after about 1 minute when the material started to dry.

APPENDIX D

FIRE DEPARTMENT INSTRUCTIONS FOR FIGHTING TANK FIRES INVOLVING DEPLETED URANIUM ARMOR AND AMMUNITION WHICH CONTAINS DEPLETED URANIUM (STABALLOY)

NOTE

The person in charge of the firefighters should read these guidelines, should be briefed by a member of the tank crew as to the types of ammunition actually loaded in the burning tank, and should obtain the advice of the EOD team before deciding when to approach the scene of the fire.

D-1. The primary hazard under these circumstances is not the radiation emitted by the DU, but rather, the explosive/fragmentation hazards caused by the activation of high explosive-type rounds, DU rounds, etc. loaded in the tank. The DU will either be in solid penetrator form, solid fragmented pieces of penetrator and/or armor, or as a DU oxide dust that forms as the penetrator and/or exposed armor is heated in the fire. However, the radiological/toxicological characteristics of the DU are a secondary hazard for a person fighting the fire for the following reasons:

a. DU emits very low levels of penetrating radiation. Therefore, a firefighter will receive very low levels of radiation exposure to his body upon approaching the tank, whether the DU is located in or outside the tank.

b. Self-contained breathing apparatus that is worn by firefighters will protect against the inhalation of any DU oxide dust which would be entrained in the smoke plume of the fire. Burn tests that have been conducted on these DU rounds indicate that very little DU, if any, is contained in the fire's smoke plume.

c. Significant concentrations of DU oxide dust could be expelled from the tank in the event of an explosion, after an appreciable amount of DU has oxidized. For this to happen, the DU will have had to be subjected to the heat of the fire for several hours before the explosion. Keeping out of the downwind plume or wearing self-contained breathing apparatus will provide respiratory protection.

D-2. When approaching scene of fire, prevent entry into smoke cloud by equipment and personnel.

D-3. High intensity ammunition fires and small explosion must be expected; ammunition smoke/fumes are toxic.

D-4. When ammunition is directly involved in fire or rounds have been expelled from the tank, no attempt to fight the fire will be made. Fire trucks will be positioned not closer than 366 meters (1,200 feet) to the burning tank.

D-5. When the decision is made by the fire department for firefighters to approach the tank, it should be upwind from any smoke coming from the tank, and at a maximum angle to the line of the gun barrel.

D-6. Firefighters must wear self-contained breathing apparatus, protective clothing, and gloves when approaching a burning tank.

D-7. Expose the minimum necessary number of firefighters to the fire.

D-8. Water is the most effective agent for extinguishing a fire involving high explosives.

D-9. When ammunition is not involved in the fire, and the hatches are open, the fire should be fought with water stream/spray, using as much protective cover as possible.

D-10. Foam, in a wet mix, may effectively be used to extinguish fires in explosives. It's disadvantage for this use is that it is not as good a cooling agent as water and it conceals the extinguished, but still dangerous, residue. This concealment increases the probability that the sensitive explosive will be stepped upon, and increases the difficulty of cleanup after the fire (high explosives which have not completely burned may actually be more sensitive and dangerous than before being subjected to fire).

D-11. High explosive materials have all the oxygen necessary for combustion included in their chemical composition. Therefore, dry powder, carbon dioxide (CO_2), or other agents which extinguish fires by smothering or displacement of oxygen, are not effective in extinguishing fires in explosives.

D-12. Ideally as little water as possible should be used to put out the fire inside the tank. Since the solid DU penetrators and/or DU armor may experience some oxidation during the fire, the water that flows out of the tank may be contaminated with DU oxide dust. As a precautionary measure, firefighters should avoid stepping in any water which has flowed out of the tank.

D-13. If the engine is on fire, only dry chemical or foam should be used to extinguish the fire.

APPENDIX E

RECOMMENDED EQUIPMENT FOR DETECTION, DECONTAMINATION AND DISPOSAL OF DEPLETED URANIUM

The following equipment may be of use at the site of an accident/incident involving depleted uranium. Quantities and applicability will vary depending on location and extent of accident. Installations responsible for storage, transportation, or use of ammunition containing depleted uranium should maintain, or be aware of locations where the following equipment can be obtained upon short notice, in an emergency situation.

Beta-gamma survey meter (AN/PDR-27, AN/VDR-2 (IM-243 meter and DT-616 probe, or equivalent)

Alpha survey meter (AN/PDR-60, AN/PDR-54, AN/PDR-56F (IM-160F/PDR-56 meter with DT-590A/PDR-56 X-ray Probe and DT-224B/PDR-56 main probe) or equivalent)

First aid kit

Protective Clothing
- coveralls
- neoprene gloves
- disposable gloves
- head covers
- shoe covers (non paper type, rubber boots)
- goggles
- respirator (M25 or M17A2 protective mask or equivalent)
- respirator cartridges (M13A2 filter element or equivalent)
- masking tape

Posting Equipment
- rope
- radiation signs
- radiation labels
- heavy duty tape
- twine

Tools
- scissors
- tongs
- pliers
- screwdriver
- knife

Surveying and Sampling Supplies
- cotton swabs
- disposable bottles
- large plastic bottles
- smear and smear holders
- tweezers
- plastic bags
  - large
  - small

Decontamination Aids
- soap, regular and abrasive
- detergents
- cleanser
- gauze pads
- paper towels
- cotton balls
- cleaning tissues
- hand cream

Radioactive Waste Collection
- 30 gallon/55 gallon drums with lids
- 30 gallon/55 gallon 4 mil plastic bags
- plastic bottles for liquids

Miscellaneous
- adhesive tape
- pencils/pens
- notepads

APPENDIX F

RECOMMENDED MAXIMUM PERMISSIBLE CONTAMINATION LEVELS [a]

Contaminated Item	Corrective Action	Maximum Alpha		Maximum Beta	
		Fixed (b) (dpm/100cm2)	Removable (c) (dpm/100cm2)	Fixed (b) (mrad/hr at 2.5cm)	Removable (c) (dpm/100cm2)
1. Personal clothing, including shoes	see note 1	200	none	0.05	none
2. Protective clothing					
a. General	see note 1	1000	200	0.02	1000
b. Respirators	see note 1	200	none	0.06	none
c. Laundry	see note 2	—	—	—	—
3. Work area and equipment (unrestricted use)	see note 3	5000	500	0.05	500
4. Vehicles (unrestricted use)	see note 4	1000	500	0.05	500
5. Skin					
a. Body	see note 5	200	none	0.06	none
b. Hands	see note 5	400	none	0.06	none

Decontaminate soil to 35 picocuries per gram

note 1: Replace or dispose as radioactive waste if above limits
note 2: Release only to NRC licensed launderer, if contaminated, or dispose as radioactive waste
note 3: Control and post, then decontaminate if above limits
note 4: Decontaminate if above limits
note 5: Continue decontamination if above

(a) Reference: AR 385-11
(b) Measured with a calibrated radiation measurement instrument
(c) Determined using smears analyzed with a calibrated counting system

APPENDIX G

PERSONNEL CONTAMINATION RECORD

Name: _____ Social Security Number: _____

Date Of Incident: _____ Time Of Occurrence: _____

Location Of Incident: _____

_____

Description Of How Contamination Occurred: _____

_____

_____

_____

_____

How Was Contamination Discovered? _____

SURVEY RESULTS

Survey Performed By: _____

Survey Instrument Manufacturer And Model: _____

Serial Number: _____ Probe Type: _____

Indicate type, extent, and magnitude of contamination below on a sketch of a human figure.

APPENDIX H

TANK FIRE CHECKLIST

_____ 1. Secure the area.

_____ 2. Notify the nearest fire department.

_____ 3. Notify the local authorities.

_____ 4. Notify HQ USAREUR Operations Center (OPCTR) via telephone.

_____ 5. Call EOD.

_____ 6. Call the local RPO.

_____ 7. Call the Public Affairs Officer.

_____ 8. Establish a controlled access area around tank. The boundary limits are specified in TM 9-1300-206.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
02144

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Your Address

DATE SENT: 31 July 1997

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TB 9-1300-278	21 July 1996	Guidelines for Safe Response to Handling Storage, and Transportation Accidents

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1-3	1-4		

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In the next to the last sentence, change "NRC license, Sub-1536" to "NRC license, Sub-1786." Since the NRC license number has been changed.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

John C. Doe, GS-12
DSN 793-1234

SIGN HERE

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meter = 0.3937 Inch
1 Decimeter = 10 Centimeters = 3.94 Inches
1 Meter = 10 Decimeters = 100 Centiimeters
= 1000 Millimeters = 39.37 Inches
1 Dekameter = 10 Meters = 32.8 Feet
1 Hectometer = 10 Dekameters = 328.08 Feet
1 Kilometer = 10 Hectometers = 1000 Meters
= 0.621 Mile = 3,280.8 Feet
Millimeters = Inches times 25.4
Inches = Millimeters divided by 25.4

WEIGHTS

1 Centigram = 10 Milligrams = 0.154 Grain
1 Decigram = 10 Centigrams = 1.543 Grains
1 Gram = 0.001 Kilogram = 10 Decigrams
= 1000 Milligrams = 0.035 Ounce
1 Dekagram = 10 Grams = 0.353 Ounce
1 Hectogram = 10 Dekagrams = 3.527 Ounces
1 Kilogram = 10 Hectograms = 1000 Grams = 2.205 Pounds
1 Quintal = 100 Kilograms = 220.46 Pounds
1 Metric Ton = 10 Quintals = 1000 Kilograms = 1.102 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liter = 0.034 Fluid Ounce
1 Centiliter = 10 Milliliters = 0.34 Fluid Ounce
1 Deciliter = 10 Centiliters = 3.38 Fluid Ounces
1 Liter = 10 Deciliters = 1000 Millileters = 33.82 Fluid Ounces
1 Dekaliter = 10 Liters = 2.64 Gallons
1 Hectoliter = 10 Dekaliters = 26.42 Gallons
1 Kiloliter = 10 Hectoliters = 264.18 Gallons

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inch
1 Sq Decimeter = 100 Sq Centimeters = 15.5 Sq Inches
1 Sq Meter (Centare) = 100 Sq Decimeters
= 10,000 Sq Centimeters = 10.764 Sq Feet
1 Sq Dekameter (Are) = 100 Sq Meters = 1,076.4 Sq Feet
1 Sq Hectometer (Hectare) = 100 Sq Dekameters = 2.471 Acres
1 Sq Kilometer = 100 Sq Hectometers = 1,000,000 Sq Meters
= 0.386 Sq Mile

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.061 Cu Inch
1 Cu Decimeter = 1000 Cu Centimeters = 61.02 Cu Inches
1 Cu Meter = 1000 Cu Decimeters = 1,000,000 Cu Centimeters
= 35.31 Cu Feet

TEMPERATURE

5/9 (°F – 32°) = °C
9/5 (°C+ 32°) = °F
–35° Fahrenheit is equivalent to –37° Celsius
0° Fahrenheit is equivalent to –18° Celsius
32° Fahrenheit is equivalent to 0° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
100° Fahrenheit is equivalent to 38° Celsius
212° Fahrenheit is equivalent to 100° Celsius

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.452
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.574
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.350
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound–Feet	Newton–Meters	1.356
Pounds–Inches	Newton–Meters	0.11298
Pounds per Square Inch	Kilopascals	6.895
Ounce–Inches	Newton–Meters	0.007062
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609
Centimeters	Inches	0.394

TO CHANGE	TO	MULTIPLY BY
Meters	Feet	3.281
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton–Meters	Pound–Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.352
Kilometers per Hour	Miles per Hour	0.621
°Fahrenheit	°Celsius	°C = (°F–32)x5/9
°Celsius	°Fahrenheit	°F = (9/5x°C)+32